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Presenting the Cultural Significance Index of Plants in the Muara Lawa, Kutai Barat District

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Abstract

The use of cultural significance index (CSI), as a tool to calculate the use value of plants, is a growing trend in quantitative ethnobotany research. This study was aimed to measure the CSI of 24 edible plants species, using the valuation method of "Cultural Food Significance Index, CFSI by Pieroni (2001)", to indigenous people in Muara Lawa, Kutai Barat district. The main plant species measured were 20 fruit plants and four other plants namely 2 vegetables plants and 2 palms were also measured as a comparison. The result showed that the type of fruit plants is relatively lower than or become suborninate role of four other plants. Only 40% of the total of 20 plant types of fruits that have CSI > 100 or as much as 60% of fruits plants with CSI <100. For analysis and presentation, we applyed cluster analysis and factor analysis, and showed a proper function, as well as providing additional information, such as the classification of groups of plants based on similar of the cultural significance, and identify groups of subindex variables are dominant in determining the score of CSI.

Key words :, Cultural significance, Fruit plants, Muara Lawa, Kutai Barat.

1. Introduction

Tropical forests in Borneo Island not only has primacy as dipterocarp forest which produce superior timber, but also contain a wealthy biological resources that providing livelihoods for local communities.(Sist , and Nguyen-Thé 2002; Fuller, Meijaard, Christy, and Jessup 2010). The indigenous peoples, Dayak Benuaq, living around the study area (Muara Lawa sub districts), still rely heavily on forest resources for various everyday life purposes, such as food, medicine, building materials, clothing, firewood, cosmetic, craft materials, local technologies and ritual materials (Munawaroh, and Purwanto 2008; Mulyoutami, Rismawan, and Joshi 2009; Gönner 2011).

One of the social benefits to be concerned is the cultural significance of forest resources for the communities, especially for the indigenous people living around the forest. Cultural significance for an organism has been defined as the importance of the role that the organism plays within a particular culture (Pieroni, 2001). However, the cultural significance measurements that are carried out to the community covering the response behavior, system knowledge, and their thoughts that social orientation on plants as objects. A process that is commonly used to quantify the data from the ethnobotany study is expressed as index. For example, the cultural significance Index (CSI) as an anthropological approach undertaken by Turner (1988), Stoffles *et al.* (1990), and Silva *et al.* (2006). Relative Cultural Importance (RCI) Indices developed by Prance *et al.* (1987), Phillips and Gentry (1993a, 1993b), Kvist *et al.* (1995), Pieroni (2001), and Lykke *et al* (2004). Through ethnobotany study, the researchers apply the " use value " to produce a numerical scale or calculate the value of cultural significance of plants. The main challenge in this quantitative trend is how to produce values that are reliable and comparable measures of less tangible qualitative data, including statistical applications.

Research on the benefits of non-timber forest products (NTFPs) with quantitative ethnobotany study using ICS measurements have been carried out around the study area, which is in East Kalimantan. For example, research on indigenous people's dependence on non-timber forest products ever undertaken by Mulyoutami *et al.* (2009), Munawaroh and Purwanto (2008, 2011), Ajiningrum (2011), and Juliana (2011). They have managed to find different types of plants which are material and NTFPs that had been used by forest communities in East Kalimantan. However, quantitative studies with ICS analysis that was developed to assess the importance of plants to the community, only calculates a score individually on each type, which then the score of all subindex variables summed to obtain a total of CSI. They do not present how the linkage of groups of plants and which one of the variables group that are most dominant in determining the total value of CSI. This is because they use the CSI concept, namely Turner's CSI that has not been equipped with multivariate analysis to present the linkages individually or as a groups of plants in generating the importance value at subindex variable or the value of CSI. Yet according to Hoffman and Gallaher (2007), CSI are quantitative measurements designed to transform the complex, multi-dimensional concept of "importance" into comparable numerical scale or value.

Turner (1988) developed a researchers subjective approach to measure CSI. The main assumption in measuring the CSI is "use". To measure CSI, Turner used only three variables, namely the quality of use, intensity of use, and the exclusivity of use. Furthermore, CSI is the sum of multiplication of the three uses. Generally, the measurement results only present the CSI each plant species vertically, does not analyze and present horizontal relationships, between individuals and groups of plant species in generating total value of CSI. In the CSI measurement method by Turner, although the type of plants used for food, especially for staple food, allocated the highest score, but the measurements have not been reaching out to the taste appreciation of the plant object as a food. Furthermore Pieroni (2001), developed the CS measurement called "The cultural food significance index, CFSI ". Pieroni using seven variables to measure CFSI, ie citation frequency, availability, frequency of use, part that being used, multi-fungsional food use, taste appreciation, and food-medicinal role. However similar to Turner's CSI, this method has not been applying multivariate statistics to analyze and present the horizontal relationships, between individuals and groups of plant species in generating total value of CSI.

In this paper; 1). We measure and present the cultural significance index of 24 species of edible plants, using a valuation "Cultural Food Significance Index, CFSI" by Pieroni (2001). The main species measured were 20 plants of fruit and as the comparison four other plants were also measured, namely 2 vegetable plants and 2 palms. 2). Description of the application of several multivariate statistical methods to analyze and present the results of the CSI measurement. This is to answer the question whether the application of some statistical method, ie cluster analysis and factor analysis can uncover additional information in order to obtain a better understanding and complete.

2. The Study Area and Its People

This study site is situated in Muara Lawa, represents the part of Kutai Barat district. Kutai Barat district is located in East Kalimantan province that is eastern part region of the Borneo Island in Indonesia (Figure 1). Borneo compromises a land area of 743,330 km^2, making it the third largest island in the world. The territory is divided among three countries; Brunei Darussalam in the northwest, two Malaysian states, Sabah and Sarawak, and the remaining southern two-thirds Kalimantan, Indonesia. Lowland rainforests and mountainous forests are historically the dominant vegetation type in Borneo. Lowland rainforests are characterized by highly diverse plant species that have a complex horizontal structure with three to five canopies of vegetation. The province East Kalimantan is located 113° 44' – 119° 00' East (longitude) and 4° 24' North – 2° 25' South (latitude) along the equator on the island of Borneo. The topography of the region varies from lowland forests to mountainous areas in the north. Annual temperature ranges from 16.4°C to 35.4°C, with a wider diurnal temperature fluctuation than the annual fluctuation. The main rainy season falls in November to April while May through October is relatively dry. Annual rainfall ranges from 1500 mm to 4500 mm (Crevello, 2003). Kutai Barat district is covering 32,000 km^2 and occupying almost 15 % of the province, its area is dominated by large tracts of pristine forest in the north and agricultural areas and secondary regrowth in the relatively flat areas in the south, namely Muara Lawa. This district has considerable potential for emission reductions due to its large amount of forested land with high potential for carbon sequestration. However, land use changes fast as a response to fulfilling the district's target of economic development, with plantations and mining growing rapidly (Mulyoutami, Rismawan, and Joshi. 2009).

Natives in Muaralawa is Dayak Benuaq; Originally, Dayak Benuaq people are hunters and natural forests have been an inseparable component of Benuaq livelihood. Recently, most Dayak practice swidden agriculture, traditionally involving long and complex rotations of crops and trees on various patches of land. Their indigenous knowledge systems are heavily integrated into their mosaic of land use practices. In the field of development there is now recognition that indigenous knowledge may be the key to sustainability. The mining industry and oil palm plantations has brought over a rapid and irreversible change in the traditional land use systems in the Dayak land. Dayak Benuaq have remained active in hunting, collecting honey, wax, scented woods, nuts and bird's nests. Even in the present days, gathering of non-timber forest products (NTFP) has an important role in many areas. (Crevello, Stacy. 2004; Johana, Suyanto, Widayati, Zulkarnain, Müller, and Budiman 2013).

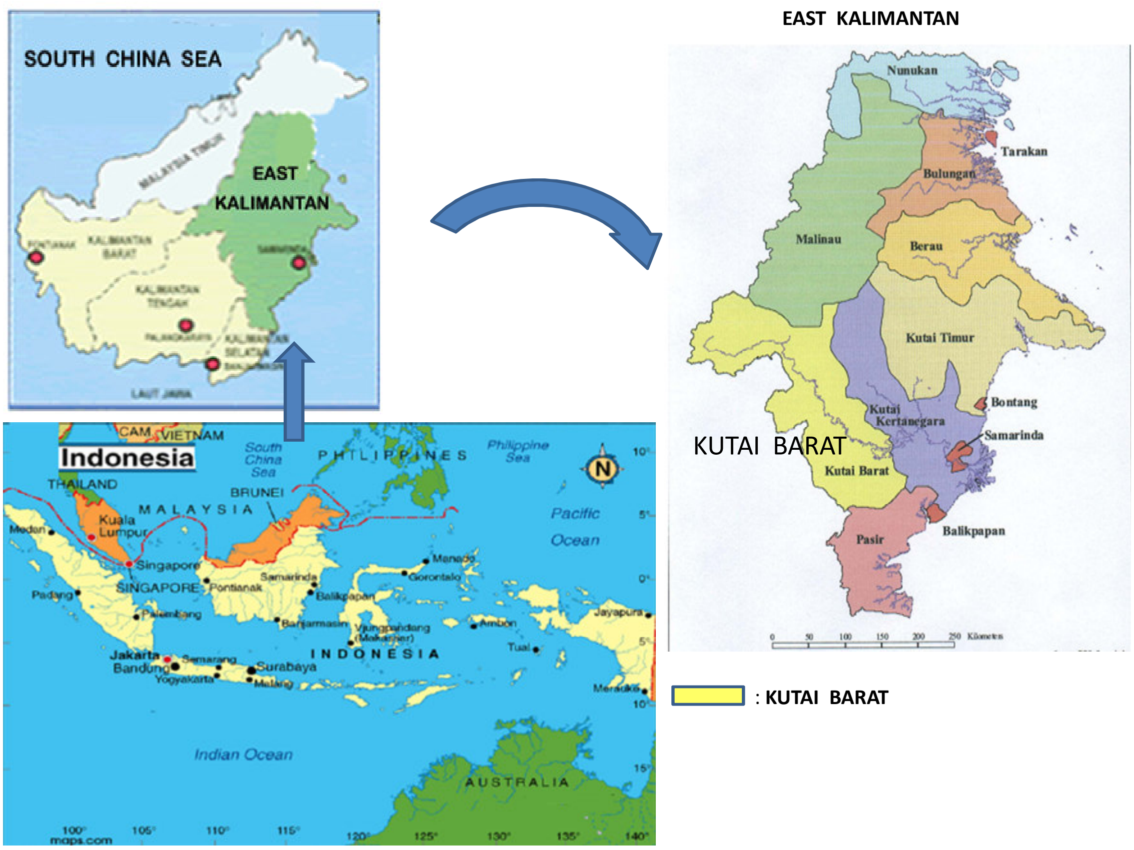

Figure 1. Location of study area in Kutai Barat

Data collection sites in Muara Lawa includes 4 villages, namely Kampung Dingin, Kampung Payang, Kampung Lotaq ,and Kampung Lambing. Reasons for the selection of the research sites are in the villages are still many parents and community leaders who have the traditional knowledge relating to the use of biological resources in their lives. Location of study area are presented in Figure 1.

3. Method

Research activities from preparation to on-site data collection took place from March 2014 to December 2014. The data collection in the field of ethnobotany emik and etik approach. Emik approach (society knowledge) by preparing the mindset of society into a system through a list of questions or interview guidelines. Preparation was done by making the guidelines for the interview, measurement framework and a list of 24 species of edible plants, with each local name, the name of the plant family and the possibility of use category. Furthermore, a semi-structured interviews was conducted in 4 villages with 100 informants. The selection of informants was done in collaboration with the village leader. Each interviews took about 2 hours and species were referred to by reviews their local names. While etik approach aimed to directly get the scores for each variable of interest culture of edible plants

3.1. Subindex Variables

To measure the index of cultural significance of the plants, we used " *The cultural food significance index*, *CFSI* by Pieroni 2001". The formula takes in account seven variables or indexes which express the frequency of quotation index (QI), the availability index (ALl). the frequency of utilisation index (FUT), the plant parts used index (PUI), the multifunctional food use index (MFFI), taste score appreciation index (TSAI), and the food-medicinal role index (FMRI). However, we made adjustments toward the options and scores of some subindex variables. The cultural significance index were calculated following the formula:

$$CSI = QI \times AI \times FUI \times PUI \times MFFI \times TSAI \times FMRI \times 10^{-2}$$

Quotation Index (Ql). The quotation index expresses the number of all the positive responses given by the informants about a kind of fruit plant, while answering a request to spontaneously mention all the known and used plant edibles.

Availability Index (AI). This index expresses the availability of the plants, perceived by locals and corrected by a factor that considers if the use of the plant is ubiquitous or localised within the studied area. In this case variable AI is diminished by half or one. (Table 1).

Table 1. Availability Scores

Scores	If Availability
4.0	Very common
3.0	Common
2.0	Middle
1.0	Rare
	If Localisation of The use
Equal	Ubiquitary
-0.5	localised
-1.0	Very localised

Frequency of Use Index (FUI). This index represents the frequency of the utilisation of each plant. Informants answer the question " how often do you eat ? " (Table 2).

Table 2. Utilisation Frequency Index (UFI) Scores

Scores	If Utilisation Frequency:
5.0	> Once/week
4.0	Once/week
3.0	Once/month
2.0	> Once/year but < once/month
1.0	Once/year 1.0
0.5	No longer used
Plants with seasonal use	
Scores	If Utilisation Frequency
3.0	> Once/week
2.5	Once/week
2.0	> Once/ Season
1.0	Once/ Season

Part Used Index (PUl). This index expresses the multiple use of diverse parts of the same plant. It takes into accounl whether multiple morphological plant parts are collected and eaten instead of single parts. (Table 3)

Table 3. Part Used Index (PUI) Scores

Scores	If Part that being used:
3.0	Whole aerial parts
2.0	Ieaves with a few stems or whole aerial parts of very young plants
1.5	Roots or rootstocks or bulbs or leaves or fruits.
1.0	Stems or bark or seeds or shoots
0.75	Buds or flowers or shoots, only younger parts

Multi-Functional Food Use Index (MFFl). This index considers the possible food uses of each single vernacular taxa. Values were assigned to traditional food preparations, excluding new "imported" or "creative" utilisation. In the case or species which are boiled and then further processed (stewed, stuffing for diverse preparations). the value attributed to the boiling process is increased by a half unit. (Table 4)

Table 4 Multi-Functional Food Use Index (MFFI) Scores

Scores	If Usage
1.5	Raw in salads or Boiled then stewed of fried or than as stuffing for diverse preparations
1.0	Soups (mixtures) or Stewed or Roasted or Condiment or Syrups or Boiled
0.5	Raw as snack or Jams or Jellies or Fried in fat

Taste Score Appreciation Index (TSAI). This index represents the scores by which locals expressed their taste appreciation for each plant. Scores are based on a possible range of values between 4 and 10 (Table 5).

Table 5. Taste Score Appreciation lndex (TSAI)

Scores	If Taste Appreciation
10	Best
9	Very good
7.5	Good
6.5	Fair
5.5	Poor
4	Terrible

Food Medicinal Role Index (FMRI). This index reflects the perceived properties as food-medicine for each quoted species. Supposed ritual or magical "health" aspects related to the ingestion of some particular species were considered in the evaluation of these values (Table 6).

Table 6. Food-Medicinal Role Index (FMRI) Scores

Scores	If Role as Food-Medicine
5.0	Very high ("thai food is a medicine!")
4.0	High ("that food. is quite a medicine", with clear specification of the treated affections)
3.0	Middle-high ("that food is very healthy")
2.0	Middle-low ("that food is healthy", no specification of a particular therapeutic action)
1.0	Not recognised

3.2. Analysis Using the Multivariate Statistics

Multivariate statistical methods used included cluster analysis and the combination of factor analysis and principal components analysis.

Cluster analysis is used to classify objects (plants) into several clusters based on the measurement (dissimilarities) of CS variables, in order to obtain particular clusters consisted of plants that are more similar than the plants of different clusters. At first, the calculation is done to measure the dissimilarity between plants using euclidean distance (Johnson, and Wichern 1988; Hoft, Barik, and Lykke 1999; Makihara and Yagi 2010). Furthermore, the merger using the technique "hierarchical agglomerative" and the determination of similarity using "complete linkage" (Johnson, and Wichern 1988; Hoft, Barik, and Lykke 1999; Kettenring 2006). In the merger with hierarchical agglomerative, initially each plant is a cluster of its own. Then two closest clusters are first grouped, and these initial groups are merged according to their similarities. Eventually, as the similarity decreases, all subgroups are fused into a single cluster. The complete lingkage occurs when groups are fused according to the distance between their farthest membes. This is the opposite of single linkage occurs when groups are fused according to the distance between their nearest members.

Factor analysis is used to describe the covariance relationships among seven variables in terms of a few underlying, but unobservable, random quantities called factors. There are two methods of solution for the analysis of factor, namely the principal component and the maximum likelihood, here we use the principal component method that aim to project the seven-dimensional onto a three-dimentional hyperspace, such that minimum information on the distances between variable scores is lost. Furthermore to perform orthogonal transformation, we used the varimax rotation. This is to facilitate identifying which variables have a large weight in each component of the remaining three principal components. (Jolliffe 1986; Johnson, and Wichern 1988; Hoft, Barik, and Lykke 1999; Conti, Frühwirth-Schnatter, Heckman, and Piatek 2014). To computerize the application of multivariate statistics, we are using the software S-Plus and SPSS.(Becker, Richard, and Cleveland. 1996; Carey, and Wang 2001; Norusis, and Marija 2012)

4. Results

The results of measurements on the cultural significance index of plants are presented in Table 7. Measurements carried out on 24 species of edible plants, in which 20 of them are fruit plants, two vegetable plants, and two palm plants. Results of measurement of the ICS each plant which has been ranking listed at last column in the table.

CSI measurement results placed *Arengan pinnata* as plant with highest culture significance, CSI = 676. Two vegetable plants, namely Red Kelakai and Green Kelakai (*Stenochlaena palustris*) were in second and third rank, both with CSI value above 300, while the palm plant (*Eugeissona*

Table 7. Plant names and Cultural Significance Index (CSI) values

No	Scientifiec Names	Lokal Name	Botanical Family	QI	AI	FUI	PUI	MFFI	TSAI	FMRI	**CSI**
1	*Arenga pinnata*	Saraf, Enau (Ind)	Arecaceae	55	3	3	3	2	6,5	3,5	676
2	*Stenochlaena palustris*	Paku meaq Kelakai merah (Ind)	Blechnaceae	78	4	1,5	2	2	6,5	3	365
3	*Stenochlaena palustris*	Paku hijau Kelakai hijau (Ind)	Blechnaceae	76	4	1,5	2	2	6,5	3	356
4	*Mangifera pajang*	Payang	Anacardiaceae	75	3	2	1,5	2,5	7,5	2	253
5	*Artocarpus lanceifolius Roxb*	Obeeq, Keledang (Ind)	Moraceae	48	3	2,5	1,5	2	7,5	3	243
6	*Artocarpus elasticus blume*	Pepuat, Terap (Ind)	Moraceae	50	3	2,5	2	2	7,5	2	225
7	*Eugessona utilis*	Nangeq, Bertan (Ind)	Palmae	75	2	1	2,5	2,5	7,5	3	211
8	*Mangifera odorata griffith*	Kuweni	Anacardiaceae	46	3	2	2,5	1,5	8	2,5	207
9	*Calamus manan*	Ngono, Manau (Ind)	Palmae	60	4	2	2,5	1,5	5,5	2	198
10	*Mangifera caesia Jack*	Wanyi, Binjai (Ind)	Anacardiaceae	45	3	2	1,5	2,5	7,5	2	152
11	*Dimocarpus longan ssp malesianus*	Ihau, Mata kucing (Ind)	Sapindaceae	95	4	3	1,5	0,5	7,5	2	128
12	*Durio kutejensis (hassk.)*	Lai, Lai (Ind)	Bombacaceae	85	4	2,5	1,5	0,5	9	2	115
13	*Baccaurea Puberula*	Mawooi,		50	2	2	1,5	2	7,5	2	90
14	*Durio dulcis Becc.*	Tuola, lahung (Ind)	Bombacaceae	85	3	2	1,5	1,5	6,5	1	75

Table 7. (contiunued).

No	Scientifiec Names	Lokal Names	Botanical Family	QI	AI	FUI	PUI	MFFI	TSAI	FMRI	**CSI**
15	*Mangifera similis*	Bulau, Asam putar (Ind)	Anacardiaceae	49	3	2	1,5	0,5	9	2	40
16	*Baccaurea pyriformis*	Keliwatn, Kapul kecil (Ind)	Euphorbiaceae	55	3	2	1,5	0,5	7,5	2	37
17	*Baccaurea macrocarpa(Miq)M. A*	Pasi, Kapul (Ind)	Euphorbiaceae	55	3	2	1,5	0,5	6,5	2	32
18	*Mangifera decandra kosterm*	Konyot, Kemang (Ind)	Anacardiaceae	45	3	2,5	1,5	0,5	5,5	2	28
19	*Nephelium maingayi*	Ridatn	Sapindaceae	54	3	2,5	1,5	0,5	7,5	1	23
20	*Nephelium ramboutan-ake (Labill) Lennh*	Maritan/Semayap	Sapindaceae	50	3	2	1,5	0,5	7,5	1	17
21	*Diospyros discolor*	Mentot, Mentega (Ind)	Ebenaceae	38	3	2	1,5	0,5	6,5	1	11
22	*Urceola brachysepala Hook.f.*	Letan, Gitaan (Ind)	Apocynaceae	35	3	2	1,5	0,5	6,5	1	10
23	*Dracomonto dao (blanco) Merr*	Dahu, Sengkuang (Ind)	Anacardiaceae	35	3	2	1,5	0,5	4	1	6
24	*Baccaurea bracteata*	Rambai (Ind)	Euphorbiaceae	30	2	1	1,5	0,5	4	1	2

(Ind) = Indonesia name.

Measurement results of the cultural significance index of 24 plants, In Muara Lawa, Kutai Barat District.

utilis) only occupies rank seventh. Among fruit plants, four plants that have the highest CSI are *Mangifera pajang* with CSI = 253, *Artocarpus lanceifolius Roxb* with CSI = 243, *Artocarpus odoratissimus* with CSI = 225, and *Mangifera odorata griffith* with CSI = 207, respectively. There is no type of fruit plants which have CSI > 300 and only four fruit plants or only 20% of the total 20 fruit plants that have CSI between 100-200. The remaining 12 fruit plants or 60% have CSI <100.

It appears from the results of measurement of use value of the plants, which are based on the cultural significance, that the value of good taste does not guarantee having a higher CSI. Fruit plants such as *Mangifera similis*, *Mangifera odorata griffith* and *Durio kutejensis (hassk.)* have better taste and very likely to have a higher economic value, but have CSI that is lower than of Red Kelakai and Green Kelakai. This is reasonable because the assessment is based on aspects of cultural value. In the area of this study, both vegetable plants are available everywhere and are considered beneficial to health, so both have high scores on the variables availability and medicinal-role.

Figure 2, presented the classification of plants, in dendogram of cluster analysis results of the data of this CSI study. In the euclidean distance of about 70, cluster analysis classifying plants into four cluster; A = {1. *Arenga pinnata*}, B = {2. *Stenochlaena palustri*/Red Kelakai and 3. *Stenochlaena palustris*/Green Kelakai}, C in the form of a set of fruit plant plus vegetable *Eugeissona utilis*, with the number of species = {4,5,6,7, and 12}, and cluster D a set of fruit plants, with a number of species = {13, 14, 15, ..., 24}. Furthermore, in euclidean distance of about 40, cluster C is classified into cluster C_1 = {4. *Mangifera pajang*, 5. *Artocarpus lanceifolius Roxb*, 6. *Artocarpus elasticus blume*, 7. *Eugessona utilis*, and 8. *Mangifera odorata griffith*}, and cluster C_2 in the form of a set of fruit plants with number of species = {9, 10, 11, and 12}. While cluster D classified into D1 = {13. *Baccaurea Puberula*, and 14. *Durio dulcis Becc.*}, and cluster D_2 a set of fruit plants with number of species = {15, 16, 17,. , , , 24}. Local name every species of plants which corresponds to the number of species can be seen in Table 7.

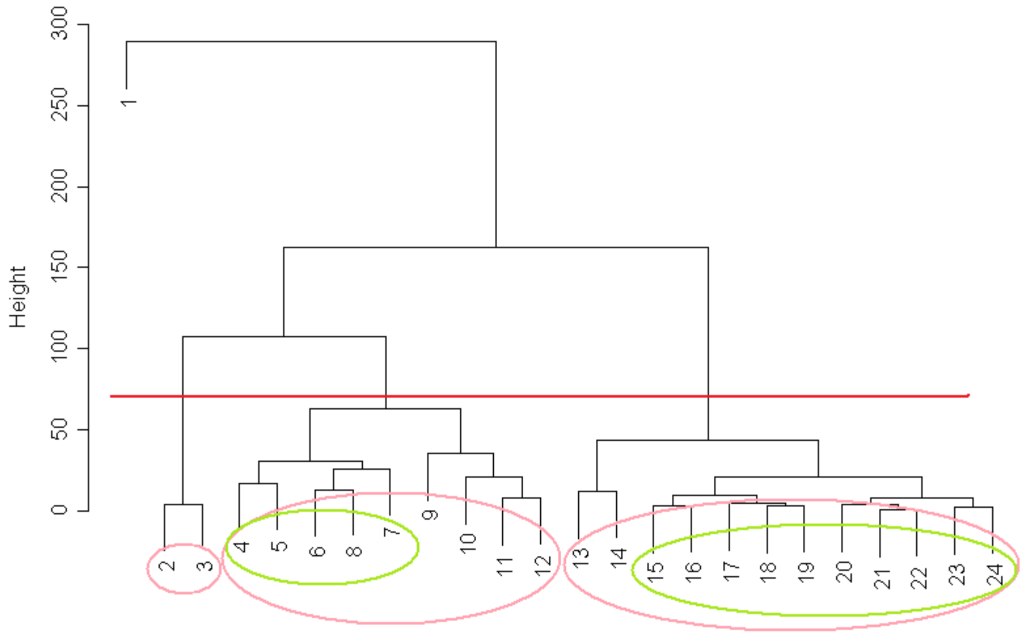

Figure 2. Cluster analysis results, in the form of dendogram, which presents the classification of the plants

The results above, shows that the application of this cluster analysis of the CSI data can provide the classification of groups of plants based on the similarity of their variables cultural significance, and presents well through dendogram.

The application of a combination of factor analysis with principal component analysis, shows that this analysis can generate dimension reduction process, from 7 dimensions of variables (QI, AI, FUI, PUI, MFFI, TSAI, and FMRI) into 3 dimensions of new variables (3 principal components). In the first phase, three-dimensional representation is obtained through the application of principal component analysis method, which can simply be regarded as a certain mathematical algebra process, which aims to maximally maintain variations of existing scores in the seven-dimensional configuration of the data, but the result is reduced to only represented by three-dimensional configuration data. The second phase, implemented an transformation, called varimax rotation, to assist identifying which variables have a large weight in one component of the remaining three principal components.

In Table 8, the results of principal component analysis showed that the representation of the variance can be explained by three main components is 98.43%. Furthermore, by applying varimax rotation on these factor analysis, obtained groups of variables are dominant in determining the score CSI

Table 8. The Proportion of total variance explained of the principal component analysis extraction method

Total Variance Explained						
Component	Initial eigenvalues			Extraction sums of squared loadings		
	Total	% of variance	Cumulative %	Total	% of variance	Cumulative %
1	6,586	94,085	94,085	6,586	94,085	94,085
2	,224	3,204	97,289	,224	3,204	97,289
3	,080	1,144	98,434	,080	1,144	98,434
4	,054	,774	99,207			
5	,024	,337	99,544			
6	,016	,235	99,779			
7	,015	,221	100,000			

Results of the factor analysis in the form of *loadings* of each subindex variables on the components of the factors presented in Table 9. The results showed that the first factor that is dominant in determining the CSI is a linear combination of variables: frequency of the utilisation index (FUI), plant parts used index (PUI), food-medicinal role index (FMRI) and taste score appreciation index (TSAI), F_1 = 0,846 FUI + 0,767 PUI + 0,693 FMRI + 0,601 TSAI. In this study, this linear combination of four variables given name as “use quality factor ” and variable that has the biggest *loading* is frequency of the utilisation. The second factor is a linear combination of frequency of quotation index (QI), availability index (AI), and multi-functional food use index (MFFI), ie F_2 = 0,812 QI + 0,791 AI + 0,596 MFFI, and named as “familiarity factor”.

Table 9. Factor loadings of variables on components

Variables	Components		
	1	2	3
QI	,447	,812	,360
AI	,541	,791	,266
FUI	,846	,434	,281
PUI	,767	,514	,352
MFFI	,542	,596	,588
TSAI	,601	,640	,457
FMRI	,693	,588	,389

The factor analysis results using principal component analysis extraction method and varimax.rotation method

5. Discussion

The measurement results of the cultural significance index of the plants in this study, place *Arenga pinnata* as the plant that plays the most important role for the communities. This plant has the highest score on the measurement results of the variables part used (PUI) and the food-medicinal role (FMRI), and high scores on the variable frequency of use (FUI), as well as moderate scores on the variables availability (AI) and the multi-functional food use (MFFI). The results of interviews with informants, affirm that the *Arenga pinnata* turned out to have been recognized to provide a wide range of use for the indigenous people, such as the use of sap taken from its flower bunches to make palm sugar, used as mixed drinks from its fruit seeds, as a medicine from roots, and various other uses even in the form of not edible. The Native community recognizes that *Arenga pinnata* is generally grown in the fields, even though it does not require special maintenance and the number of trees is also relatively few, but can be used any time. This is because it has multi-functional use and production without seasonal pattern, so that every tree and his parts can alternately being used without exploitation. In addition, some uses of the tree parts, like making fibers and leaf midrib, can simultaneously serve as a maintenance for himself.

This study place the fruit plants, especially semi-wild, relatively lower than or become subordinate role of 4 other plants. This is because the location of the study, the types of fruits from the cultivation and fruits from outside the area have been widely available in the local market. The fruits which are not from the community fields, tend to shift or play a role as a substitute in the fruit consumption in the communities. The factor of "time" also has influenced food choice. The harvest of semi-wild fruits took much longer than that two vegetable plants, which were normally collected near the house and also two palm provide production without seasonal pattern.

The application of multivariate statistics to analyze and present the CSI measurements in this study, in fact can provide additional information which is very likely useful for utilization or further study on the CS research. This multivariate statistics can function properly, as an instrument for analyzing and presenting data on plants cultural significance. Cluster analysis can provide information about the classification of groups of plants according to their cultural significance. The combination of principal component analysis and factor analysis can provide information on which variables are dominant in determining the value of cultural significance for the plants. Information about the classification of groups of plants can be used as material for further studies, such as forest management activities for the public benefit which require priority study or sampling that represent some nature of particular importance. Priorities can be determined by tracing where the nature of priority importance is allocated among the clusters classification that presented. Furthermore, one cluster of plants can be selected as a reference, adding some plants from the nearest other cluster if necessary, and setting aside the plants originating from isolated clusters.

Some plant species found in the study which had quitea high cultural significance, generally grown on land around the woods or fields owned by communities. This is indicating the importance of land ownership or farm for the survival and sustain local livelihoods of indigenous people in Muara Lawa, Kutai Barat district.

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